PCT WORLD INTELLECTUAL PROPERTY ORGANIZATION
International Bureau

INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 7 : B29C 45/14

A1

(11) International Publication Number: WO 00/30827

(43) International Publication Date: 2 June 2000 (02.06.00)

(21) International Application Number: PCT/GB99/03867

(22) International Filing Date: 22 November 1999 (22.11.99)

(30) Priority Data:
9825479.0 21 November 1998 (21.11.98) GB

(71) Applicant *(for all designated States except US)*: CARLING POINT LIMITED [GB/GB]; Central House, Llanfechain, Powys SY22 6UJ (GB).

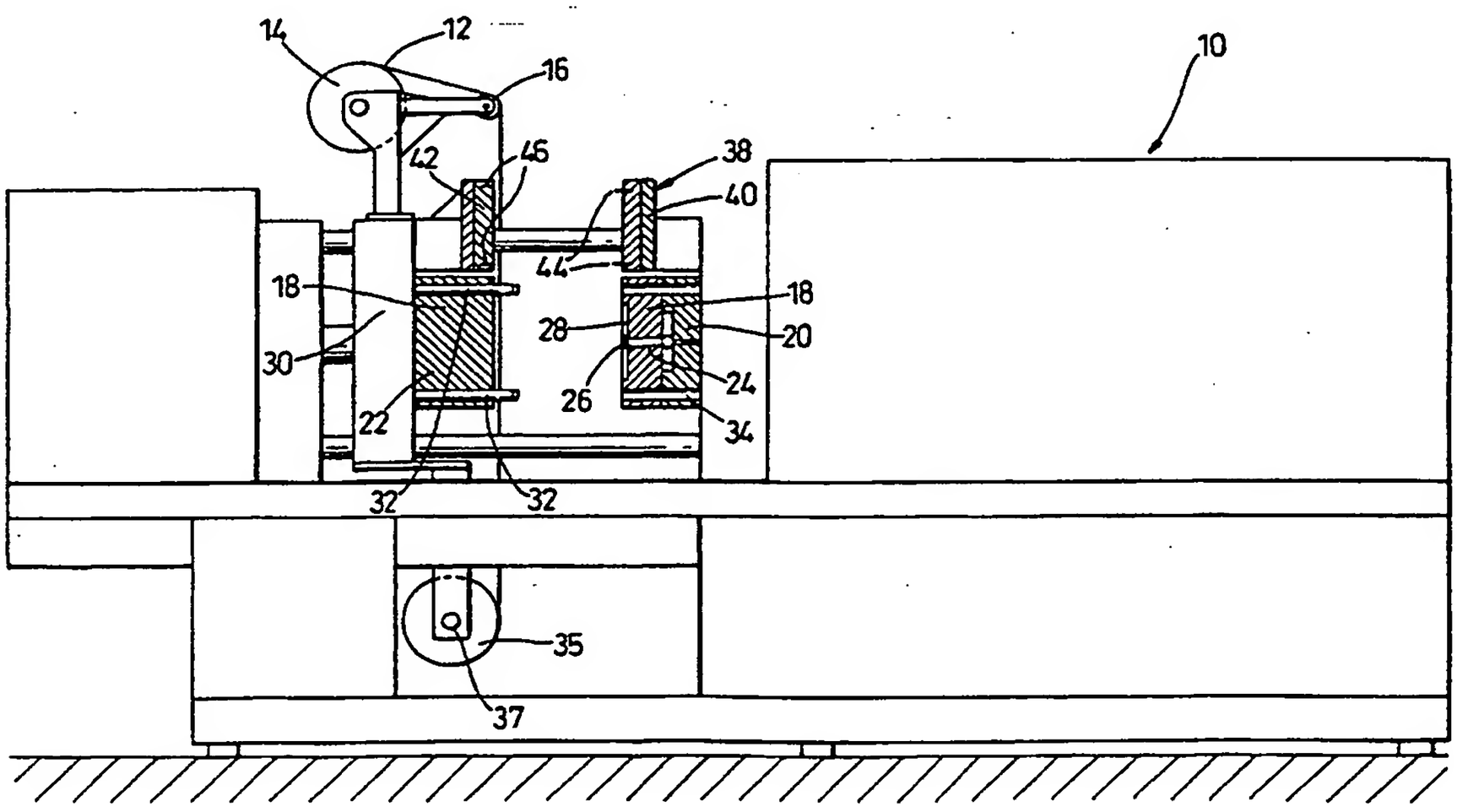
(72) Inventors; and
(75) Inventors/Applicants *(for US only)*: MARGETTS, Mark, Geoffrey, Newland [GB/GB]; Carling Point Limited, Central House, Llanfechain, Powys SY22 6UJ (GB). EATON, Neil, Adrian [GB/GB]; Carling Point Limited, Central House, Llanfechain, Powys SY22 6UJ (GB). FISHER, Andrew, William [GB/ZW]; Mechanical Engineering Division, Bulawayo Polytechnic, P.O. Box 1392, Bulawayo (ZW). TAYLOR, Nick [GB/GB]; Pera International, Technology Centre, Melton Mowbray, Leicestershire LE13 0PB (GB).

(74) Agent: POWELL, Timothy, J.; Eric Potter Clarkson, Park View House, 58 The Ropewalk, Nottingham NG1 5DD (GB).

(81) Designated States: AE, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CR, CU, CZ, DE, DK, DM, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).

Published
With international search report.

(54) Title: IN–MOULD LABELLING



(57) Abstract

A method of moulding and labelling in combination comprises providing a web of material with pre–printed information. The web is serrated so as to divide the web into label portions. The label portions are provided in a moulding tool such that they become detached during the moulding process and attached to moulded product.

FOR THE PURPOSES OF INFORMATION ONLY

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AL	Albania	**ES**	Spain	**LS**	Lesotho	**SI**	Slovenia
AM	Armenia	**FI**	Finland	**LT**	Lithuania	**SK**	Slovakia
AT	Austria	**FR**	France	**LU**	Luxembourg	**SN**	Senegal
AU	Australia	**GA**	Gabon	**LV**	Latvia	**SZ**	Swaziland
AZ	Azerbaijan	**GB**	United Kingdom	**MC**	Monaco	**TD**	Chad
BA	Bosnia and Herzegovina	**GE**	Georgia	**MD**	Republic of Moldova	**TG**	Togo
BB	Barbados	**GH**	Ghana	**MG**	Madagascar	**TJ**	Tajikistan
BE	Belgium	**GN**	Guinea	**MK**	The former Yugoslav Republic of Macedonia	**TM**	Turkmenistan
BF	Burkina Faso	**GR**	Greece			**TR**	Turkey
BG	Bulgaria	**HU**	Hungary	**ML**	Mali	**TT**	Trinidad and Tobago
BJ	Benin	**IE**	Ireland	**MN**	Mongolia	**UA**	Ukraine
BR	Brazil	**IL**	Israel	**MR**	Mauritania	**UG**	Uganda
BY	Belarus	**IS**	Iceland	**MW**	Malawi	**US**	United States of America
CA	Canada	**IT**	Italy	**MX**	Mexico	**UZ**	Uzbekistan
CF	Central African Republic	**JP**	Japan	**NE**	Niger	**VN**	Viet Nam
CG	Congo	**KE**	Kenya	**NL**	Netherlands	**YU**	Yugoslavia
CH	Switzerland	**KG**	Kyrgyzstan	**NO**	Norway	**ZW**	Zimbabwe
CI	Côte d'Ivoire	**KP**	Democratic People's Republic of Korea	**NZ**	New Zealand		
CM	Cameroon			**PL**	Poland		
CN	China	**KR**	Republic of Korea	**PT**	Portugal		
CU	Cuba	**KZ**	Kazakstan	**RO**	Romania		
CZ	Czech Republic	**LC**	Saint Lucia	**RU**	Russian Federation		
DE	Germany	**LI**	Liechtenstein	**SD**	Sudan		
DK	Denmark	**LK**	Sri Lanka	**SE**	Sweden		
EE	Estonia	**LR**	Liberia	**SG**	Singapore		

IN-MOULD LABELLING

This invention relates to a method and apparatus for moulding and labelling. In particular this invention relates to in-mould labelling.

It is known to mould articles such as plastic food packaging with information incorporated within the mould product. Such a process is known generally as in-mould labelling. The process involves inserting a pre-printed label and inserting it into an injection mould tool cavity. The label is then retained in the mould cavity at a predetermined position and the plastic feedstock is then injected into the mould. The label is then formed as an integral part of the finished product.

The label is normally pre cut and then loaded onto the 'male' halves of the tool cavity before the injection process commences. The plastic feedstock may be injected from either the male or female side of the tool. The plastic feedstock commonly comprises polypropylene or polyester (PET). These materials are particularly suitable because of their high transparency, mechanical strength and dimensional stability at high temperatures.

It is also known to include the provision of a continuous sheet of labelled material fed directly into injection moulding apparatus. Individual labels are then cut in the mould by individual cutter blades mounted in the tool cavities. Such a process is disclosed in prior patent numbers FR 2735063 and EP 633117. However, the cutting tool quickly becomes blunt due to the hot and pressurised conditions within the mould cavity.

International patent number WO 9634730 discloses an in-mould labelling

process for smart cards whereby a sheet of labelled material is cut into smaller pieces which are then fed into the injection moulding tool.

Patent number FR 2684327 discloses a label loading device attached to the moulding tool. Pre cut labels are taken from the magazine and placed in the mould cavity. The loading machinery is actuated by the moving plate using rollers and guides.

One problem associated with in-mould labelling is that small quality differences in the printing of the labels can cause large quality differences in the final in-mould labelled product. Such variations can affect the amount of shrinkage the label experiences and can introduce a curl into the labels when cut causing handling problems.

It is also known to provide a moulding process commonly known as 'in-mould decoration' (IMD). The IMD process involves providing printed ink on the carrier web. During the moulding process, this ink transfers from the carrier web to the moulded part. Thus, there is no incorporation of the whole label into the moulded part. This process is a combination of injection moulding and hot stamp foil techniques. The foil is made predominantly from polyester. A carrier web is provided with decorations and during the labelling process hot foils are pulled from a roll through the moulding apparatus. During the injection moulding operation the decoration is lifted off the carrier web and under the influence of pressure and temperature attaches itself to the surface of the moulded product. This process requires the use of a hot stamping foil modified for the process, a foil feed, and a modified injection mould tool.

The IMD process is not suitable however, for 3D articles, due to the force

required to pull the material through the moulding apparatus and the consequent distortion of the foil.

It is an object of the invention to provide an improved method and apparatus for moulding and labelling which attempts to alleviate the aforementioned problems and provide improvements generally.

According to the invention there is provided a method of moulding and labelling comprising the steps of providing a web of material with pre-printed label information, serrating the web in a predetermined position so as to divide the web into detachable label portions, placing a serrated label portion of the web still attached to the web, within a moulding tool such that the label becomes detached from the web during the moulding process and is attached to a moulded product.

Also according to the invention there is provided moulding and labelling apparatus comprising a cutting tool, a moulding tool and a web comprising pre-printed information, said cutting tool being adapted to provide serrated portions in a predetermined position on the web so as to form detachable labels, said labels being adapted to be detachable under the application of heat and pressure within the mould tool and said cutting tool being positioned external to the moulding tool.

Embodiments of the invention will now be described by way of non-limiting examples with reference to the accompanying drawings in which:

Figure 1 is a side view of a moulding apparatus according to an embodiment of the invention;

Figure 2 is a side plan view of the moulding apparatus of Figure 1;

Figure 3 is a plan view of the webs used in the moulding apparatus of Figures 1 and 2;

Figure 4 is a side view of a moulding apparatus according to a further embodiment of the invention; and

Figure 5 is a side plan view of the moulding apparatus of Figure 4.

Conventional horizontal injection moulding apparatus according to an embodiment of the invention is shown generally at 10 in Figure 1. A reel of web 12 is fed through the moulding apparatus 10 via rollers 14 and 16. The reel of web 12 comprises pre-printed label information or decoration.

An injection mould tool 18 comprises two halves 20,22. An injection device 24 is provided within tool half 20. The injecting end 26 of the tool 18 is positioned within a tool cavity 28. Tool cavity 28 comprises a shape corresponding to the shape of the article to be moulded. In this embodiment the tool cavity 28 is shaped so as to be suitable to produce plastic video cases.

The second half 22 of the injection mould tool 18 is mounted on a moving platen 30, moveable in a transverse direction.

The web 12 is mounted on platen 30 between the first 20 and second 22 halves of the mould tool 18.

The web 12 is then attached to a further reel 35 mounted adjacent the

platen 30 and under the injection moulding tool 18. Reel 35 is attached to a motorised shaft 37 which winds in the 'used' web during the labelling and moulding operation.

A cutting or serration tool 38 is mounted vertically above the injection mould tool 18. The cutting or serrating tool 38 comprises two halves 40,42 separated by an approximately equal distance to the distance between the halves 20,22 of the injection tool 18. The first half 40 comprises serrated cutting blades 44. The second half 42 comprises slots 46 adapted to receive the cutting blades 44. A plurality of cutting blades 44 and corresponding slots 46 are provided.

During the label serration operation the second half 42 of the cutting tool 38 moves toward the first half 40 such that the web 12 is cut by the blades 44 passing through the web into corresponding slots 46.

During the combined labelling serration and moulding process the platen moves the second half 22 of the injection tool toward the first half 20. The moving platen 30 also simultaneously moves the second half 42 of the serration tool 38 towards its first half 40. Web 12, comprising pre-printed label information, is positioned via rollers 14,16 and 35, between the halves 42,40 and 22,20 of the serration 38 and moulding 18 tools. The web 12 is cut at predetermined positions to form label sections 48. Since the cutting blades are serrated the label sections 48 of web 12 are not completely removed from the web 12 after having been cut. They remain attached to the web 12 via small uncut sections or tabs.

The film carrying the serrated label portions 48 then progresses, via the movement of motorised rollers, to be positioned between the two halves

20,22 of the moulding tool 18. Since the labels are still attached to the web they can be accurately positioned within the mould tool 18. The platen 30 moves transversely such that mould tool half 22 moves towards mould tool half 20 to form the closed tool cavity 28 and the injection moulding process commences. The molten injection moulding feedstock is injected into the closed tool cavity and formed into the desired shape.

A serrated label portion 48 is positioned accurately between mould tool halves 20,22 during the moulding process. Since the label portion is serrated this enables the label to be accurately indexed into position within the mould. The pressure and temperature of the moulding process causes the serrated label portion 48 to be removed from the web 12 and be attached to the mould article (not shown). During this moulding process the feedstock surrounds and adheres the label such that the label forms part of the moulded article.

The surplus film is then transferred to roll 35 and recycled.

It is also envisaged that a sliding carriage may be used that will grip the pre-cut portion of the web/film at the die-cutting stage and transfer it to the moulding stage thereby avoiding tension being placed on the web. Final registration or positioning of the web may be achieved by means of aligning a printed target on the web with a photo-electric sensor.

Advantageously the cutting tool 38 is positioned remote from the injection mould tool 18 consequently the serration of the web 12 is performed external to the moulding process.

Also advantageously, moving platen 30 simultaneously moves both second

cutting half 42 and second moulding half 22 toward their respective first halves 40,20. Thus the serration/cutting of one label can take place during the moulding process of an adjacent label. In the case where the moulded article is a video case a number of labels may be attached to all sides of the video case during the moulding process. A web may contain a plurality of label portions 48 across the breadth of the web so as to allow multiple labelling of a moulded product.

Horizontal injection moulding apparatus 50 according to a further embodiment of the invention is shown in Figure 4.

In this embodiment, the reel 52 of web 54 is mounted to one end of an arm 56, the other end of the arm 56 being pivotally mounted so the reel 52 is moveable through a range of positions between two extreme positions 58,60.

From the reel 52, the web 54 is fed into the apparatus 50 via an arrangement of rollers including a dancing roller 62. As with the moveable reel 52, the dancing roller 62 comprises a roller attached to one end of a pivotal arm 64 that is moveable through a range of positions between two extreme positions 66,68.

In use, the positions of the moveable reel 52 and the dancing roller 62 in relation to their extreme positions 58,60 and 66,68 are determined by the tension of the web 54 passing through the moulding apparatus 50. The rollers serve to control the web 54 as it passes through the moulding apparatus 50, and the key function of the dancing roller 62 and the moveable reel 52 is to maintain the tension of the web 54.

Although the embodiment shown in Figure 4 includes a moveable reel 52, six fixed rollers and one dancing roller 62, it will readily occur to a skilled reader how, within the scope of the invention, to modify this arrangement to permit different feeding arrangements.

The apparatus 50 shown in Figure 4 is similar to the apparatus 10 shown in Figure 1 in that the injection tool 70 comprises two halves 72,74. The first half 72 mounted on a fixed platen 76 is provided with an injection device 78 within a tool cavity 80 corresponding to the shape of the article to be moulded, and the second half 74 is mounted on a moveable platen 82 that is moveable in a transverse direction.

However, in this embodiment of the invention, the web 54 is mounted on the fixed platen 76 between the first 72 and second 74 halves of the mould tool 70, rather than on the moveable platen 82. This arrangement reduces any mechanical shock that the web 54 may experience, stabilising the web 54, providing greater control, production robustness and improved design confidence.

The web 54 is attached to a motorised reel 84 adjacent the moveable platen 82, under the injection tool 70. During the labelling and moulding operation the 'used' web 54 is wound on to this reel 84, guided by a plurality of rollers positioned between the fixed platen 76 and the reel 84.

The apparatus 50 shown in Figure 4 is similar to the apparatus 10 shown in Figure 1 in that the cutting or serration tool 86 mounted vertically above the mould tool 70, comprises two halves 88,90 separated by an approximately equal distance to the distance between the halves of the injection tool 70. The first half 88 comprises a plurality of serrated cutting

blades 92 and the second half 90 comprises a plurality of slots 94 adapted to receive cutting blades 92. In this embodiment however, the first half 88 of the cutting tool 86 is mounted on the moveable platen 82 so that during the label serration the first half 88 moves towards the second half 90 of the cutting tool 86.

The cutting blades 92 provided on the first half 88 of the cutting tool 86 in this embodiment are mounted on pneumatic cylinders 96, and as the first half 88 moves towards the second half 90 of the cutting tool 86, the pneumatic cylinders 96 independently actuate the blades 92. This causes the blades 92 to pass through the web 54 into the corresponding slots 94 in the second half 90 of the cutting tool 86. The resultant label sections 87 formed in the web 54 are not completely removed from the web 54, and remain attached to the web 54 via small tabs.

Thus, the serration and moulding process using the apparatus shown in Figure 4 proceeds in a similar, but modified, manner to that described in respect of the apparatus shown in Figure 1.

Once the moulding process is completed a robot head 98 provided with sucker pads 100 may remove the moulded article from the mould tool 70. In conventional methods, the moulded articles are not removed but drop under gravity away from the mould tool 70. Removal of the articles by a robot head 98 provides full automation of the system, and is advantageous because of the added value nature of the resultant moulded articles over conventional moulded articles. The robot head 98 may also ensure that the moulded article is presented to any necessary vision or barcode readers in a repeatable manner or orientation.

A number of different printing methods may be used to pre-print label information or decoration on to the web. Two preferred methods for pre-printing the web are digital printing and flexographic printing.

The use of digital printing provides a high quality result and allows the web to be customised. This is particularly advantageous when a small number of moulded articles are required of each of a number of different label designs. The moulded articles may be produced in a continuous cycle, without the need to change the web between each different label design. Thus the overall time taken to produce the moulded products is greatly reduced.

Such labels may be provided with barcodes to allow different label designs to be identified after the moulding process, and to ensure that individual moulded products are packaged for the correct customer.

The use of flexographic printing is advantageous when a large number of moulded products incorporating the same label(s) are required. Such flexographic printing allows a web of continuous and identical labels to be printed and is lower in cost than digital printing.

CLAIMS

1. A method of moulding and labelling comprising the steps of providing a web of material with pre-printed label information, serrating the web in a predetermined position so as to divide the web into detachable label portions, placing a serrated label portion of the web still attached to the web, within a moulding tool such that the label becomes detached from the web during the moulding process and is attached to a moulded product.

2. A method according to Claim 1 wherein the label portion becomes detached from the web under the application of the heat and pressure of the moulding process.

3. A method according to Claim 1 or Claim 2 wherein the serrated portions of the web are formed so as to divide the web into label portions.

4. A method according to any one of the preceding claims wherein the method comprises in-mould labelling.

5. A method according to any one of the preceding claims wherein the serration operation is performed by a serration tool comprising at least two parts, said web being positioned between said two portions and being cut upon abutment of said parts with each other.

6. A method according to Claim 5 wherein the moulding apparatus also comprises at least two parts and the moulding operation occurs after abutment of the two mould parts against each other.

7. A method according to Claim 6 wherein movement of at least one of said serration tool parts and at least one of said mould tool parts move simultaneously so as to label a moulded product whilst also serration another label portion.

8. A method according to any one of the preceding claims wherein a robot head removes the moulded product from the moulding tool.

9. A method according to any one of the preceding claims wherein the web is digitally pre-printed.

10. A method according to any of Claims 1 to 8 wherein the web is flexographically pre-printed.

11. Moulding and labelling apparatus comprising a cutting tool, a moulding tool and a web comprising pre-printed information, said cutting tool being adapted to provide serrated portions in a predetermined position on the web so as to form detachable labels, said labels being adapted to be detachable under the application of heat and pressure within the mould tool and said cutting tool being positioned external to the moulding tool.

12. Moulding and labelling apparatus according to Claim 11 wherein said mould tool comprises two halves and said cutting tool comprises two halves.

13. Moulding and labelling apparatus according to Claim 11 or Claim 12 wherein said cutting tool is adapted to serrate the edges of said label portion such that said label portion is readily detached during the moulding process.

14. Moulding and labelling apparatus according to Claim 13 wherein said cutting tool is provided with serrated blades.

15. Moulding and labelling apparatus according to Claim 14 wherein pneumatic cylinders actuate said serrated blades.

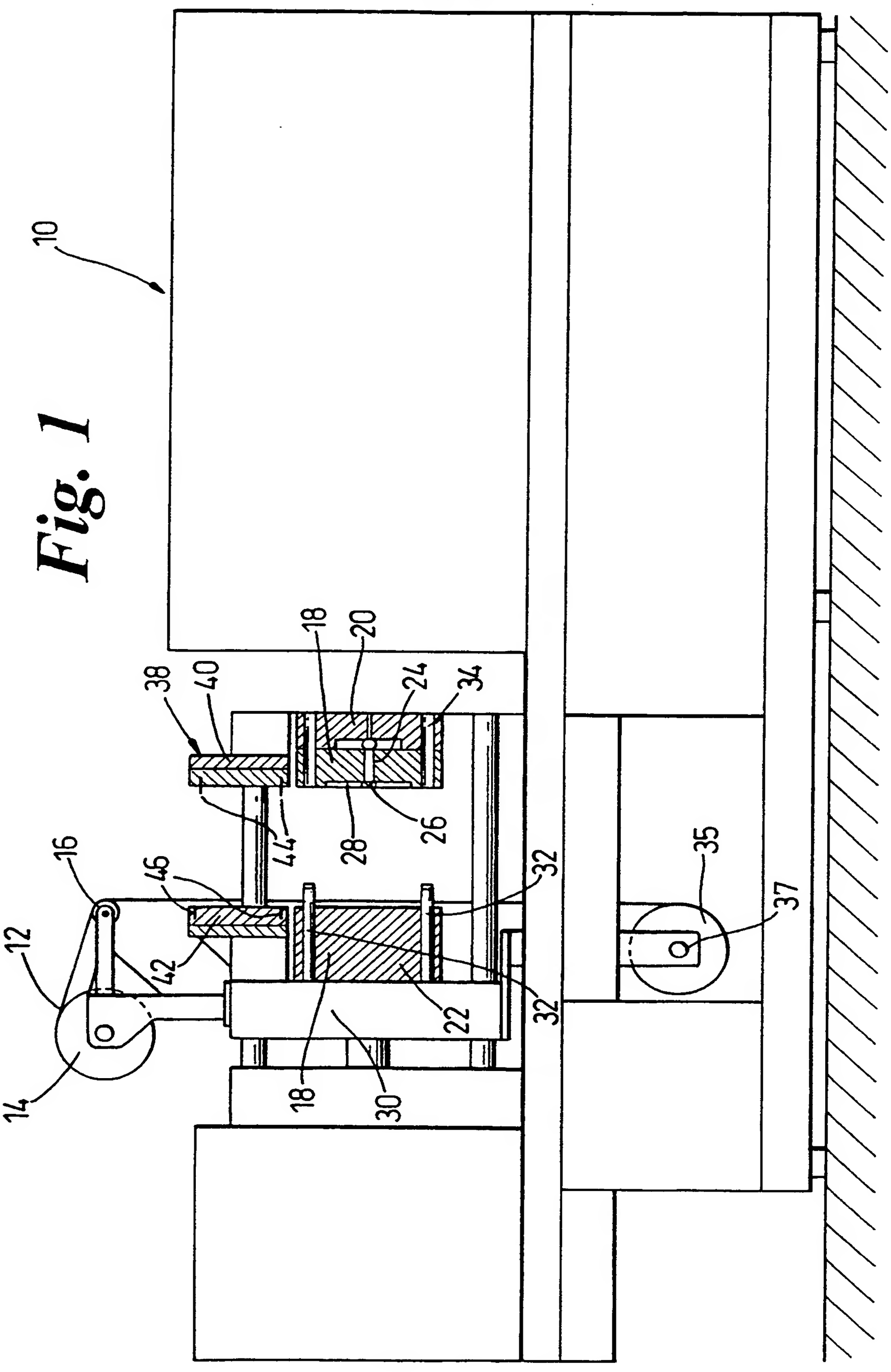
16. Moulding and labelling apparatus according to any of Claims 11 to 15 further comprising a removal member for removing a moulded product from the moulding tool.

17. Moulding and labelling apparatus according to Claim 16 wherein said removal member comprises a robot head provided with suckers.

18. A method of moulding and labelling substantially as described herein with reference to and as shown in the accompanying drawings.

19. Apparatus for labelling and moulding substantially as described herein with reference to and as shown in the accompanying drawings.

Fig. 1



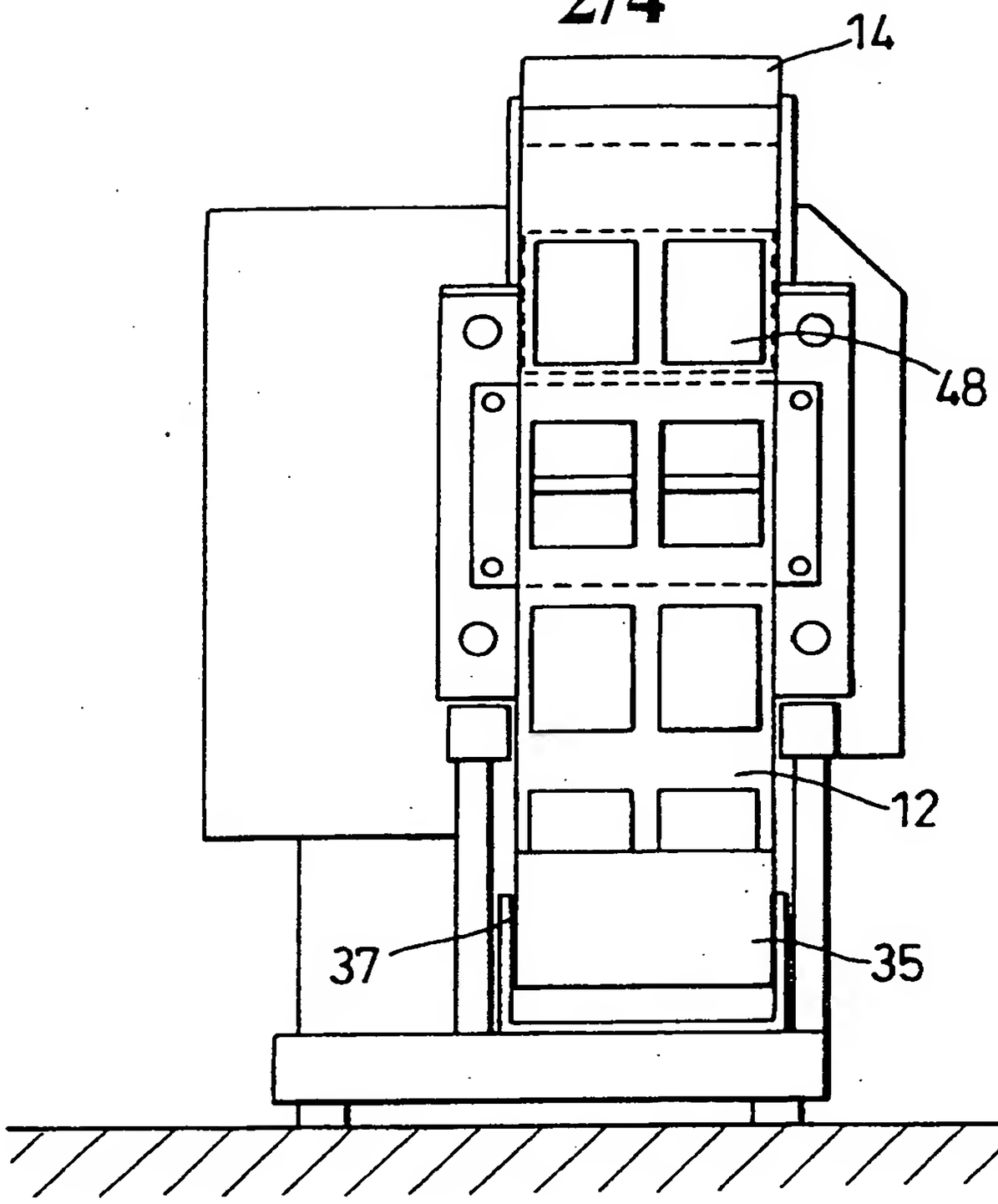


Fig. 2

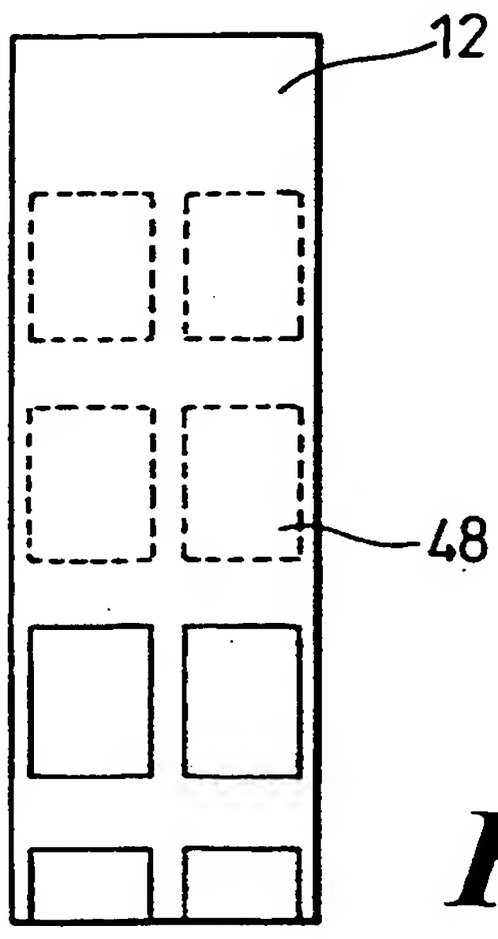


Fig. 3

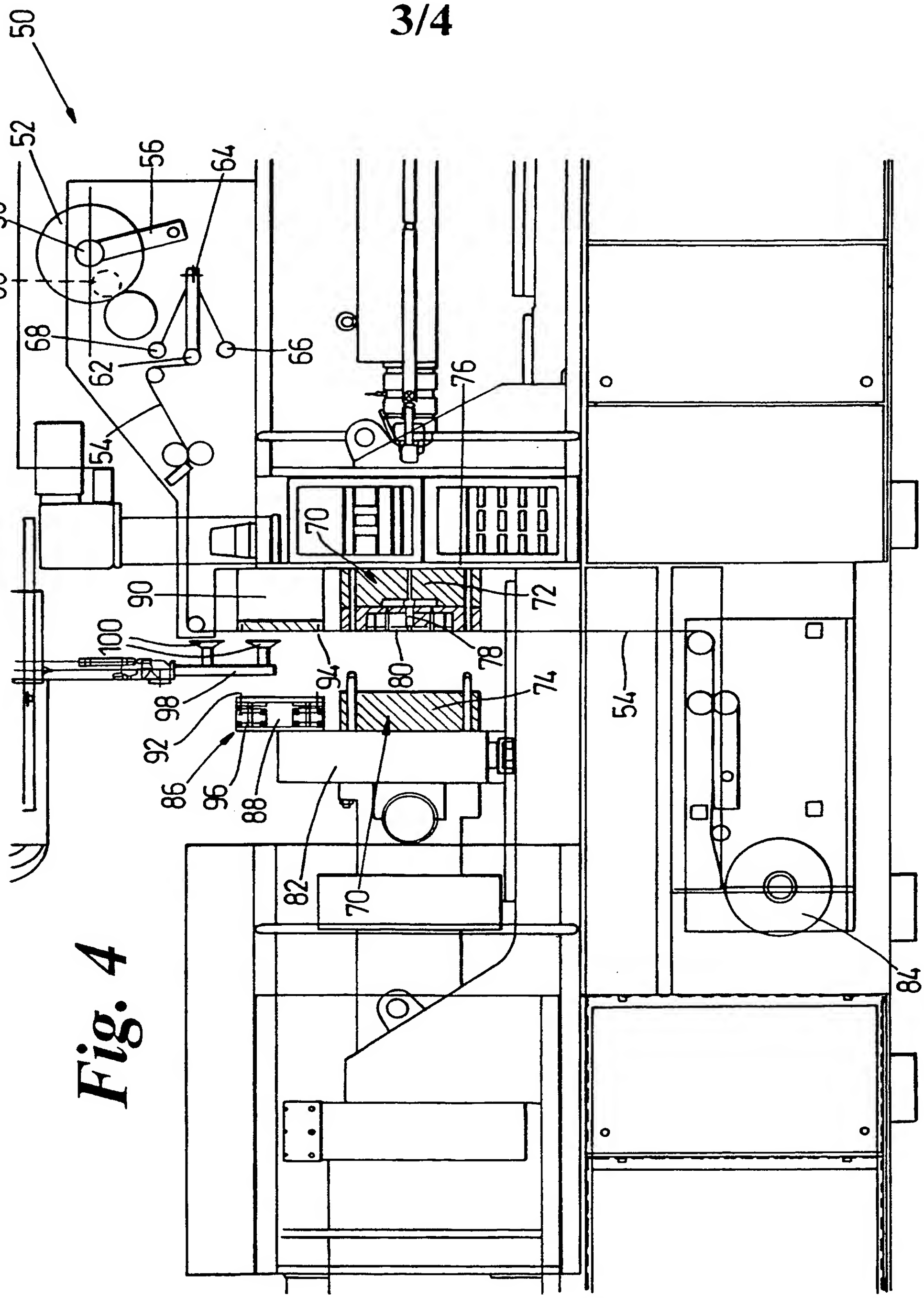


Fig. 4

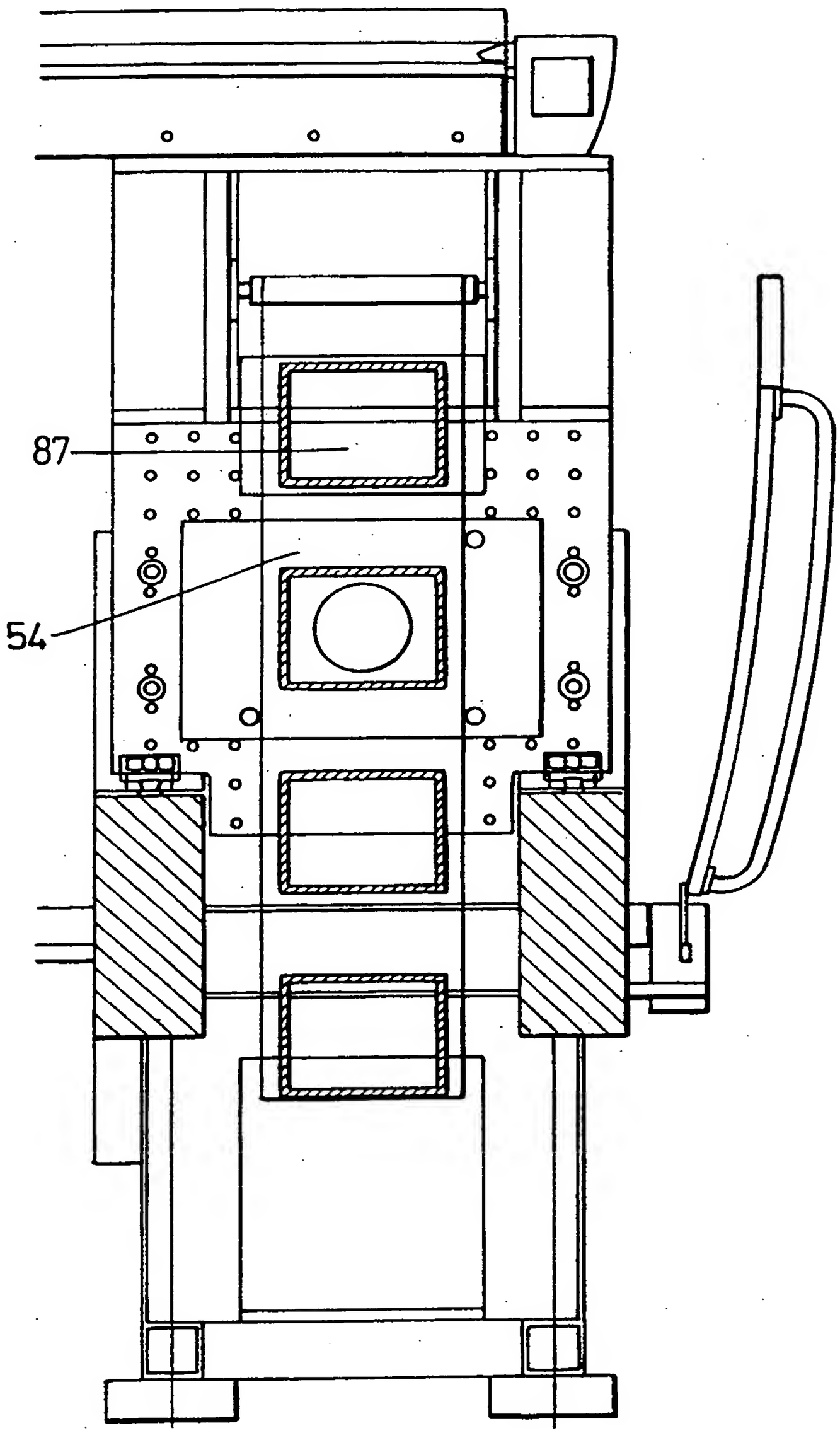


Fig. 5

INTERNATIONAL SEARCH REPORT

Intern nal Application No
PCT/GB 99/03867

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 B29C45/14

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 B29C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	PATENT ABSTRACTS OF JAPAN vol. 13, no. 265 (M-839), 19 June 1989 (1989-06-19) -& JP 01 067317 A (TOPPAN PRINTING CO LTD), 14 March 1989 (1989-03-14)	1,3-7, 11-15, 18,19
Y	abstract -& DATABASE WPI Section Ch, Week 198916 Derwent Publications Ltd., London, GB; Class A32, AN 1989-119943 XP002131511 abstract	8,16,17
Y	EP 0 249 363 A (PEERLESS PLASTICS PACKAGING) 16 December 1987 (1987-12-16) column 5, line 39 - line 47; figures 1-3	8,16,17

-/--

[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

° Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
24 February 2000	14/03/2000

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Bollen, J

1

Form PCT/ISA/210 (second sheet) (July 1992)

INTERNATIONAL SEARCH REPORT

Intern nal Application No
PCT/GB 99/03867

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication,where appropriate, of the relevant passages	Relevant to claim No.
A	DE 41 00 538 A (EMSA-WERK WULF GMBH & CO) 14 May 1992 (1992-05-14) the whole document	1,2,4,6, 11
A	US 3 651 191 A (GLATT J. E. ET AL) 21 March 1972 (1972-03-21) the whole document	1,2,4,6, 11
A	WO 92 00844 A (SMITH & NEPHEW PLASTICS) 23 January 1992 (1992-01-23) the whole document	1,4,6,11

1

INTERNATIONAL SEARCH REPORT

Information on patent family members

Inter xnal Application No
PCT/GB 99/03867

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
JP 01067317 A	14-03-1989	JP 2541235 B	09-10-1996
EP 0249363 A	16-12-1987	AT 60541 T	15-02-1991
		AU 597667 B	07-06-1990
		AU 7369887 A	17-12-1987
		CA 1274367 A	25-09-1990
		DK 296587 A,B,	12-12-1987
		GB 2191729 A,B	23-12-1987
		GR 3001830 T	23-11-1992
		IE 60202 B	15-06-1994
		JP 2518850 B	31-07-1996
		JP 63025012 A	02-02-1988
		MX 173477 B	08-03-1994
		NO 302345 B	23-02-1998
		NZ 220522 A	27-10-1989
		PT 85059 A,B	01-07-1988
		US 4795597 A	03-01-1989
DE 4100538 A	14-05-1992	NONE	
US 3651191 A	21-03-1972	NONE	
WO 9200844 A	23-01-1992	AU 650024 B	09-06-1994
		AU 8092691 A	04-02-1992
		GB 2262257 A,B	16-06-1993
		HK 135895 A	08-09-1995
		NZ 238880 A	28-04-1993